



ICC Commissioning Procedure Using the Underhill TW-DCM Clamp Meter

Equipment Required:

- Leakage Clamp Meter, with a minimum resolution of 0.1mA. e.g. Underhill TWDCM
- A spare solenoid (24V AC, with inrush current greater than holding current)
- *Optionally:* A powerful 30V AC transformer (5A AC minimum) e.g. Underhill TRANSFRMR-115V or TRANSFRMR-240V
- Small tools and wire nuts



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Installation Procedure

This section checks that the module has been correctly installed and has been recognized by the ICC.

1. Power down the ICC.
2. Remove ICC battery. (See Hun. page 4, item 20)
3. Insert module; do not connect 2 wire path(s) yet. (See UH page 8).
4. Check grounding wiring:
 - a. Green/yellow striped wire from transformer removed from the lee power module?
(see UH page 10, fig 05)
 - b. Appropriate wire size & rod size used for grounding? (see UH page 10,11)
 - c. If a mixed multi-wire & decoder system, the earth link is fitted? (see UH page 11
fig. 06)
5. Power up ICC.
6. Press the recessed reset button in the back of the ICC front panel (see Hun. Page 4, item 21)
7. Select ICC rotary dial to *Set Station Run Times* and enter 1 minute into all stations that have decoders on them.
8. Select ICC rotary dial to *Manual Single Station* without the 2 wire path connected. Select any station to run, within the decoder module's addressing range, using the *Left/Right* arrow keys.
9. Monitor the module's L1/L2 terminals with the clamp meter's red/black leads and meter set to AC volts
10. Rotate ICC rotary dial to "*Run*". A steady red light should come on module and L1/L2 should have about 28V AC on them.
11. Stop the voltage by rotating the dial to *System Off*.
12. Steady red LED will change to flashing. Clear the flashing by pressing & holding the module's push button.



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Initial 2 Wire Path Checkout

This section checks the currents on the 2 wire path are within normal limits.

1. Switch off the ICC.
2. Ensure the 2 wire path is disconnected from the Decoder Module L1 & L2
3. Instead, connect the 2 wire path to the 30V output of the TRANSFRMR115V, or
4. If this is not available, remove the 2 yellow wires from the ICC's transformer from the Power module. (See Hun page 4, item 22) and instead connect them to the 2 wire path.
5. Place the meter's current clamp around ONE of the 2 wire path wires. Position it at least 12 inches from the transformer. Set the range to 100A (or A).
6. Power up the ICC or the TRANSFRMR-115V, as appropriate. Read the current on the clamp meter.
7. **WARNING:** If more than 1.5A with the ICC transformer or 5A with the TRANSFRMR -115V, immediately turn off the power. 'GOTO SECTION: FINDING SHORTS'
8. Read the current on the clamp meter. Adjust the clamp meter range if necessary to more sensitive to get a better reading.
 - a. Normal current = $3\text{mA} \times \text{number of Underhill decoders on the 2 wire path}$. E.g. 20 decoders will have $3\text{mA} \times 20 = 60\text{mA}$ (0.06A) approximately. Investigate currents outside +/- 10% of the expected value ...
 - b. Very high current = short circuit. 'GOTO SECTION: FINDING SHORTS'
 - c. Lower current = decoders disconnected; check for a 2 wire path break. 'GOTO SECTION: FINDING OPENS OR BAD JOINTS'



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2 Wire Path Checkout; Earth Leakage

This procedure checks for the presence of any bad insulation along the 2 wire path which would allow current to leak into the earth.

1. Switch off the ICC.
2. Ensure the 2 wire path is disconnected from the Decoder Module LI & L2
3. Instead, connect the 2 wire path to the 30V output of the TRANSFRMR115V, or
4. If this is not available, remove the 2 yellow wires from the ICC's transformer from the Power module. (See Hun page 4, item 22) and instead connect them to the 2 wire path.
5. Place the meter's current clamp around BOTH of the 2 wire path wires Position it at least 12 inches from the transformer. Set the range to 400mA (or mA).
6. Power up the ICC or the TRANSFRMR-115V, as appropriate. Read the current on the clamp meter. This should be near zero.
7. Connect ONE of the transformer (or ICC yellow transformer wires) to the earth terminal on the Decoder Module. The reading on the clamp meter will increase. Note the current.
8. Remove the earth from that transformer wire and instead connect it to the other transformer wire. Note the current.
9. **WARNING:** Never connect the earth to both sides of the transformer at the same time. You will short out the transformer and burn it out.
10. If either current exceeds 50mA, there is earth leakage. This means, somewhere along the 2 wire path, there is bad insulation and current is shunting to earth. 'GOTO SECTION: FINDING EARTH LEAKAGE'



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2 Wire Path Checkout; Bad Joints

This procedure checks for the presence of any bad cable joints along the 2 wire path which would cause excessive voltage drop when a solenoid is activated.

1. Switch off the ICC.
2. Ensure the 2 wire path is disconnected from the Decoder Module L1 & L2
3. Instead, connect the 2 wire path to the 30V output of the TRANSFRMR-1 15V, or
4. If this is not available, remove the 2 yellow wires from the ICC's transformer from the Power module. (See Hun page 4, item 22) and instead connect them to the 2 wire path.
5. Power up the ICC or the TRANSFRMR-1 15V, as appropriate
6. Select AC volts (ACV) on the clamp meter and probe the transformer output to read approximately 28-30V AC.
7. With the probes still applied, touch the wires with the wires of a solenoid to activate it. Note the voltage drop under load. Near the transformer, this may be very small or no change.
8. Go to the furthest point on each leg of the field wiring and probe the 2 wire path without a load. Note the AC volts reading
9. With the probes still applied, touch the wires with the wires of a solenoid to activate it. Note the voltage drop under load.
10. On a well designed field wiring system, the voltage drop under the load of one solenoid should not exceed 5V AC. If significantly greater than this, you have a bad joint between you and the controller.
11. Work your way back down the 2 wire path taking voltage measurements, loading the path with the solenoid. When you pass the bad joint, the voltage drop under load will go back to a much lower figure.
12. Save time by working along 'halves' of the cable. Make the second measurement halfway back towards the controller. Determine which half the fault is in. Go halfway along the faulty half, make another measurement, etc. Using this technique, you can cover 20 boxes in only 5 measurements.



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Decoder Checkout Procedure

1. This section allows you to check out each decoder station while at the controller, with or without water.
2. Disconnect the 2 wire path from any transformer and reconnect it into the Decoder Module's L1 & L2.
3. If previously removed, reconnect the two yellow wires from the ICC's transformer into the ICC Power Module terminals marked 'AC' 'AC'. Polarity is unimportant. Power up the ICC.
4. Place the meter's current clamp around ONE of the 2 wire path wires. Position it at least 12 inches from the transformer. Set the range to 400mA (or IDA).
5. Select ICC rotary dial to *Manual Single Station* and if necessary, press the *Right Arrow* key until the first decoder station in the modules addressing range is selected.
6. Rotate ICC rotary dial to "*Run*". The decoder should operate. The red LED on the module should stay out and the clamp meter will indicate the sum of all the decoder currents plus the 'on' decoder's solenoid current. In the previous example of 20 decoders x 3mA per decoder = 60mA + 1 solenoid's current (200mA) = 260mA.
7. Press the "*Right*" Arrow to advance to the next station. Observe the current and red LED. Continue until all decoder stations have been tested.
8. A very high current on a particular station indicates a shorted solenoid or its wiring.
9. No increase in current above the sum of the standby currents (above example 60mA) and the red LED illuminated steadily, indicates
 - a. No decoder,
 - b. Wrong decoder address set into it,
 - c. Failed decoder,
 - d. Open circuit to or in a solenoid,
 - e. Open circuit to a decoder.
9. Remove the clamp meter from around the L1 wire. Tidy up the wiring.
10. Replace the ICC battery. Set the time & Date. (See Hun page 25)
11. Program the run times.
12. Program the start times.



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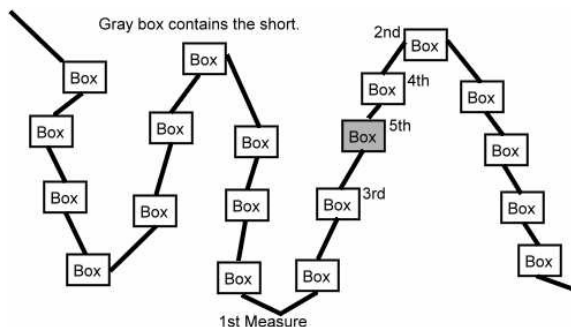
Finding Shorts in the Main Cable

Use this section if the commissioning procedure indicates a short circuit in the main 2 wire path.

1. Switch off the ICC.
2. Ensure the 2 wire path is disconnected from the Decoder Module L 1 & L2
3. Instead, connect the 2 wire path to the 30V output of the TRANSFRMR115V, or if this is not available, remove the 2 yellow wires from the ICC's transformer from the ICC Power Module. (See Hun page 4, item 22) and instead connect them to the 2 wire path
4. Place the meter's current clamp around ONE of the 2 wire path wires. Position it at least 12 inches from the transformer. Set the range to 100A (or \tilde{A}).
5. Power up the ICC or the TRANSFRMR-115V, as appropriate. Read the current on the clamp meter.

WARNING: If more than 1.5A with the ICC transformer or 5A with the TRANSFRMR115V, immediately turn off the power.

6. Break any loops in the main 2 wire path. This technique only works with branched cables.
7. Ascertain the whereabouts of major branches of the cable run. Go to the junctions and determine which branch the short is in.



8. Having identified the branch, work along the run placing the meter's current clamp around ONE of the 2 wire path wires.
9. In the example figure to the left, the thick connecting lines indicate higher than normal currents measured. Once you are past the short, the current will fall to near zero.

Save time by working along 'halves' of the cable. Make the first measurement halfway along. Determine which half the fault is in. Go halfway along the faulty half, make another measurement, etc. See diagram above. Using this technique, you can cover 20 boxes in only 5 measurements.

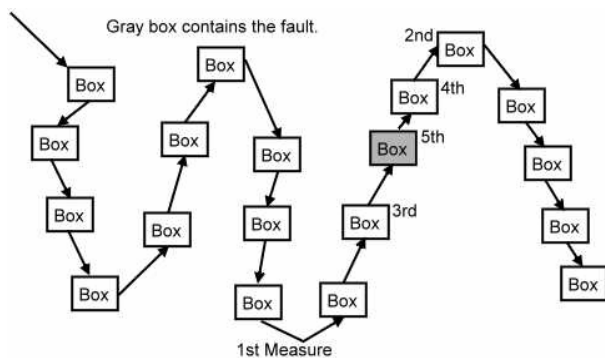


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Finding the Earth Leakage Point(s)

This section assumes you have just performed the procedure 2 Wire Path Checkout; Earth Leakage, and the transformer has the side grounded that gives the highest earth leakage reading.

1. Break any loops in the main 2 wire path. This technique only works with branched cables.
2. Measure leakage by placing the clamp meter over whole main 2 wire cable. Set the range to 400mA (or mA).
3. Ascertain the whereabouts of major branches of the cable run. Go to the junctions and determine which branch the leakage is in.



4. Having identified the branch, work along the run placing the meter's current clamp around **BOTH** of the 2 wire path wires.
5. In the example figure to the left, the thick connecting lines indicate higher than normal leakage currents measured. Once you are past the faulty insulation, the leakage current will fail significantly.
6. Save time by working along 'halves' of the cable. Make the first measurement halfway along. Determine which half the fault is in. Go halfway along the faulty half, make another measurement, etc. See diagram above. Using this technique, you can cover 20 boxes in only 5 measurements.
7. If the leakage current in a cable remains substantially the same *with the earth connection removed from the transformer*, it is still looped with a break in it.
8. To remedy the problem in (7), break the loop (or loops). After breaking, the good half will have nearly full volts on it, the bad substantially less. If in doubt, load the cable with the solenoid.



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References:

'Hun': Hunter Industries Inc.

ICC Commercial Irrigation Controllers; Owner's Manual and Installation Instructions.

'UH': Underhill International Corp. ICC Decoder Module Installation) Guide.